

REMARKS

In the January 25, 2007 final Office Action, claims 1-7, 9-15, 17-20 and 24 were rejected. Arguments are set forth below rebutting these rejections, although no amendments to the claims are presented in this paper. Reconsideration of the application is respectfully requested in view of the following remarks.

Claims 1 to 2, 9 to 10, 20, and 24 are rejected under 35 U.S.C. § 102(b) or 103(a) as being either anticipated by, or unpatentable over, the Elsevier Science Ltd. publication entitled, "AeroMet implementing novel Ti process" (Aeromet). These rejections are respectfully traversed.

To start, claim 1 recites a method in which a powder blend is spread on a platform, the powder blend comprising a base metal of titanium or alloy thereof having a first melting temperature and an alloying metal having a second melting temperature lower than said first melting temperature. An energy beam is then selectively focused onto the powder blend. Nowhere in Aeromet is there any teaching or suggestion of either of these two fundamental method steps.

Aeromet discloses a process in which a base metal substrate is heated with a laser to create a molten pool, and then another powder is fed into the molten pool. The Examiner notes that according to one embodiment, the powder that is fed into the molten pool may be a mix of elemental powders of Ti, Al, and V (Aeromet, page 25). Thus, Aeromet clearly fails to teach or suggest a method in which a powder blend is *spread into a layer* on a substrate, and then a laser is *directed only onto selected areas of the layer* of powder. A person of skill in the art would not be motivated to perform the present method, involving these two steps, when Aeromet merely discloses a method in which powder is deposited into a molten pool and then allowed to solidify (see FIG. 1 of Aeromet and associated caption). For at least this reason, Aeromet is non-analogous art and the rejections of claims 1 to 2 should be withdrawn.

Furthermore, claim 1 recites that the powder blend includes a base metal of titanium or alloy thereof, and an alloying metal, both of which are selected and quantitatively included in the powder blend based on a characteristic of the base metal to dissolve in but not react with the liquid alloying metal at a particular annealing temperature. Even though Aeromet discloses the

use of a powder of one part Ti, six parts Al, and four parts V (moles), this falls far short of teaching or suggesting that either of the Al and V is quantitatively added to the Ti in a manner whereby either the Al or V can melt at a particular annealing temperature and then not react with solid Ti. A suitable phase diagram might provide such a teaching, if the elements can in fact be combined in a manner that meets this claimed feature. However, the Examiner has failed to provide any reference that would support Aeromet in such a manner. For this additional reason, it is clear that Aeromet fails to teach or suggest the features of claims 1 and 2, and the rejections of these claims should be withdrawn.

Finally, claim 1 further recites that the alloying metal is re-solidified, and thereby binds the base metal. In contrast, Aeromet discloses a method in which the metal powder melts in its entirety and reacts to form an alloy that meets compositional and material property specifications for commercially pure Ti-6Al-4V (Aeromet, page 25). Thus, there is no binding of a base metal taking place in the Aeromet method. For this additional reason, the rejections of claims 1 and 2 should be withdrawn.

Claim 9 is also directed to a method in which *a powder blend is spread* on a platform, the powder blend comprising a base metal of titanium or alloy thereof having a first melting temperature and an alloying metal having a second melting temperature lower than said first melting temperature. An energy beam is then *selectively focused onto the layer* of powder blend. Then, the alloying metal is re-solidified to *bind the base metal*. As previously discussed, nowhere in Aeromet is there any teaching or suggestion of any one of these three method steps.

Claim 20 recites a powder blend of a base metal and an alloying metal, each being selected based at least on two criteria, namely, their differing melting points and a characteristic of the base metal to dissolve in but not react with melted alloying metal at a particular annealing temperature. The only powder blend disclosed by Aeromet is on page 25, col. 2. The powder blend consists of one part Ti, six parts Al, and four parts V (moles). This falls far short of teaching or suggesting that either of the Al and V is quantitatively added to the Ti in a manner whereby either the Al or V can melt at a particular annealing temperature and then not react with solid Ti. A suitable phase diagram might provide such a teaching, if the elements

can in fact be combined in a manner that meets this claimed feature. However, the Examiner has failed to provide any reference that would support Aeromet in such a manner. For this additional reason, it is clear that Aeromet fails to teach or suggest the features of claim

Claims 1 to 3, 9 to 11, 18 to 20, and 24 are rejected as being unpatentable over Aeromet in view of any one of U.S. Patent No. 4,725,509 (Ryan), Welding Research Publication entitled, "Transient Liquid-Phase Bonding Using Coated Metal Powders" (Zhuang), or Metallurgical and Materials Transactions Publication entitled, "Infrared Transient-Liquid-Phase Joining of SCS-6/B21S Titanium Matrix Composite" (Blue). These rejections are respectfully traversed.

The Zhuang, Blue, and Ryan references do nothing to compensate for the previously-discussed deficiencies of Aeromet. Blue is directed to a welding method in which a filler material of the alloy Ti-15Cu-15Ni is applied to a solid substrate to join two pieces of the substrate. According to the Blue welding method, all of the filler material is melted in order to create a sound joint. Thus, Blue clearly fails to teach or suggest a method in which a powder blend is spread into a layer on a substrate, and then a laser is ***directed only onto selected areas of the layer*** of powder. Furthermore, there is no teaching or suggestion of a method in which re-solidification of a portion (the alloying material) of the powder blend binds the remainder (base metal) of the powder blend since the entire powder blend is melted according to the Blue method. Thus, Blue combined with Aeromet fails to teach or suggest the methods recited in claims 1 and 9, and the rejections of these claims should be withdrawn.

Furthermore, claim 20 recites that Ti-15Cu-15N is only between 10 wt.% and 30 wt.% of a powder blend. Blue discloses that a powder blend is entirely Ti-15Cu-15N. Aeromet also fails to disclose or suggest this percentage off alloying metal. For this additional reason, the rejection of claim 20 should also be withdrawn.

Ryan is also directed to a welding method in which a filler metal that may be a Ni-Cu-Ti alloy is applied to a substrate. However, like the Blue welding method, all of the filler material disclosed by Ryan is melted in order to create a sound joint. Thus, Ryan clearly fails to teach or suggest a method in which a powder blend is spread into a layer on a substrate, and then a laser is ***directed only onto selected areas of the layer*** of powder. Furthermore, there is no teaching or suggestion of a method in which re-solidification of a portion (the alloying

material) of the powder blend binds the remainder (base metal) of the powder blend since the entire powder blend is melted according to the Ryan method. Thus, Ryan combined with Aeromet fails to teach or suggest the methods recited in claims 1 and 9, and the rejections of these claims should be withdrawn.

Furthermore, claim 20 recites that Ni-Cu-Ti is only between 10 wt.% and 30 wt.% of a powder blend. Ryan discloses that a powder blend is entirely Ti-15Cu-15Ni. Aeromet also fails to disclose or suggest this percentage of alloying metal in a powder blend, and also fails to disclose the particular percentages of Cu and Ni recited in claim 20. For this additional reason, the rejection of claim 20 based on Aeromet and Ryan should also be withdrawn.

Finally, Zhuang is directed to a transient phase liquid bonding process in which a powder coating of Ti-Cu-Ni is applied to a solid substrate as a melting point depressant. Again, Zhuang fails to teach or suggest a method in which a powder blend is spread into a layer on a substrate, and then a laser is *directed only onto selected areas of the layer* of powder. Furthermore, there is no teaching or suggestion of a method in which re-solidification of a portion (the alloying material) of the powder blend binds the remainder (base metal) of the powder blend since the entire powder blend is melted according to the Zhuang method. Thus, Zhuang combined with Aeromet fails to teach or suggest the methods recited in claims 1 and 9, and the rejections of these claims should be withdrawn. Furthermore, Zhuang fails to compensate for the deficiency of Aeromet regarding claim 20, particularly regarding the percentage of alloying metal in a powder blend, and the particular percentages of Cu and Ni recited in claim 20. For this additional reason, the rejection of claim 20 based on Aeromet and Zhuang should also be withdrawn.

Claims 4 to 5, 7, 12 to 13, and 15 are rejected as being unpatentable over Aeromet in view of Blue. Claims 6 and 14 are rejected as being unpatentable over Aeromet in view of Blue or Zhuang. These rejections are respectfully traversed for the same reasons set forth above regarding the independent claims.

Claim 17 is rejected as being unpatentable over Aeromet in view of Ryan or Blue or Zhuang, further in view of U.S. Patent No. 5,182,170 (Marcus). Claim 18 is rejected as being unpatentable over Aeromet in view of Ryan or Blue or Zhuang, further in view of Materials and

Design Publication entitled, "Processing of titanium net shapes by SLS HIP" (Suman). These rejections are respectfully traversed at least for the same reasons previously set forth. Marcus is cited for teaching powder layers of a particular thickness, and Das is cited for post-processing steps following a liquid phase sintering and isothermal solidification method. Yet, the features of the independent claims are still not met by the cited prior art, and for this reason the rejections of claims 17 to 18 should be withdrawn.

In conclusion, for the reasons given above, all claims now presently in the application are believed allowable and such allowance is respectfully requested. Should the Examiner have any questions or wish to further discuss this application, Applicant requests that the Examiner contact the undersigned attorney at (480) 385-5060.

If for some reason Applicant has not requested a sufficient extension and/or has not paid a sufficient fee for this response and/or for the extension necessary to prevent abandonment on this application, please consider this as a request for an extension for the required time period and/or authorization to charge Deposit Account No. 50-2091 for any fee which may be due.

Respectfully submitted,

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Dated: March 26, 2007

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